



[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 23

[Docket No. FAA-2012-0315; Special Conditions No. 23-257-SC]

Special Conditions: Embraer S.A., Model EMB 505; Inflatable Side-Facing Seat Three-Point Restraint Safety Belt with an Integrated Airbag Device in the Side-Facing Divan Aft Position

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions; request for comments.

SUMMARY: These special conditions are issued for the installation of an inflatable three-point restraint safety belt with an integrated airbag device at the aft position in two-place side-facing divan seats on the Embraer S.A. aircraft model EMB-505. These airplanes, as modified by the installation of these inflatable safety belts, will have novel and unusual design features associated with the upper-torso restraint portions of the three-point safety belts, which contain an integrated airbag device. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: The effective date of these special conditions is March 16, 2012.

Comments must be received on or before [INSERT DATE 30 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER.]

ADDRESSES: Send comments identified by docket number FAA-2012-0315 using any of the following methods:

Federal eRegulations Portal: Go to <http://www.regulations.gov> and follow the online instructions for sending your comments electronically.

Mail: Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE., Room W12-140, West Building Ground Floor, Washington, D.C., 20590-0001.

Hand Delivery or Courier: Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, S.E., Washington, D.C., between 8 a.m., and 5 p.m., Monday through Friday, except Federal holidays.

Fax: Fax comments to Docket Operations at 202-493-2251.

Privacy: The FAA will post all comments it receives, without change, to <http://regulations.gov>, including any personal information the commenter provides. Using the search function of the docket web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the Federal Register published on April 11, 2000 (65 FR 19477-19478), as well as at <http://DocketsInfo.dot.gov>.

Docket: Background documents or comments received may be read at <http://www.regulations.gov> at any time. Follow the online instructions for accessing the docket or go to the Docket Operations in Room W12-140 of the West Building Ground Floor at 1200

New Jersey Avenue, SE., Washington, D.C., between 9 a.m., and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Mr. Bob Stegeman, Federal Aviation Administration, Aircraft Certification Service, Small Airplane Directorate, ACE-111, 901 Locust, Kansas City, Missouri, 816-329-4140, fax 816-329-4090, e-mail Robert.Stegeman@faa.gov.

SUPPLEMENTARY INFORMATION:

Comments Invited

Interested persons are invited to submit such written data, views, or arguments, as they may desire. Communications should identify the regulatory docket or special condition number and be submitted in duplicate to the address specified above. All communications received on or before the closing date for comments will be considered by the Administrator. The special conditions may be changed in light of the comments received. All comments received will be available in the Rules Docket for examination by interested persons, both before and after the closing date for comments. A report summarizing each substantive public contact with FAA personnel concerning this rulemaking will be filed in the docket. Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this notice must include a self-addressed, stamped postcard on which the following statement is made: "Comments to Docket No. FAA-2012-0315." The postcard will be date stamped and returned to the commenter.

Background

On December 13, 2010, Embraer S.A. applied for a Design Change Application, for the installation of a two-place side-facing divan on aircraft model EMB-505. Embraer S.A. applied for, and was granted, Exemption No. 10321 to § 23.562 for the two-place divan due to its unique installation and safety requirements for the occupants. The exemption included additional testing requirements. Embraer opted to use a three-point safety belt restraint system for the aft occupant seat to meet the exemption safety requirements.

The inflatable restraint systems are three-point safety belt restraint systems consisting of a lap belt and shoulder harness with an inflatable airbag attached to the shoulder harness belt. The inflatable portion of the restraint system will rely on sensors to electronically activate the inflator for deployment.

If an emergency landing occurs, the airbag will inflate, limit forward translation and prevent contact with the forward occupant or other interior structure due to flailing. This will reduce the potential for head and torso injury and protect the forward occupant as well. The inflatable restraint behaves in a manner similar to an automotive airbag; however, in this case, the airbag is integrated into the shoulder belt. While airbags and inflatable restraints are standard in the automotive industry, the use of an inflatable restraint system is novel for general aviation operations.

The FAA has determined that this project will be accomplished on the basis of providing the same current level of safety as the conventional certification basis airplane occupant restraint systems. The FAA has two primary safety concerns with the installation of airbags or inflatable restraints:

- That they perform properly under foreseeable operating conditions; and
- That they do not perform in a manner or at such times as to impede the pilot's ability to maintain control of the airplane or constitute a hazard to the airplane or occupants.

The latter point has the potential to be the more rigorous of the requirements. An unexpected deployment while conducting the takeoff or landing phases of flight may result in an unsafe condition. The unexpected deployment may either startle the pilot or generate a force sufficient to cause a sudden movement of the control yoke. Either action could result in a loss of control of the airplane, the consequences of which are magnified due to the low operating altitudes during these phases of flight. This concern is of lesser consequence in this application because it is not installed in a cockpit position. The FAA has considered this when establishing these special conditions.

The inflatable restraint system relies on sensors to electronically activate the inflator for deployment. These sensors could be susceptible to inadvertent activation, causing deployment in a potentially unsafe manner. The consequences of an inadvertent deployment must be considered in establishing the reliability of the system. Embraer S. A. must show that the effects of an inadvertent deployment in flight are not a hazard to the airplane or that an inadvertent deployment is extremely improbable. In addition, general aviation aircraft are susceptible to a large amount of cumulative wear and tear on a restraint system. The potential for inadvertent deployment may increase as a result of this cumulative damage. Therefore, the impact of wear and tear on inadvertent deployment must be considered. The effect of this cumulative damage means a life limit must be established for the appropriate system components in the restraint system design.

There are additional factors to be considered to minimize the chances of inadvertent deployment. General aviation airplanes are exposed to a unique operating environment. The effect of this environment on inadvertent deployment must be understood. Therefore, qualification testing of the firing hardware/software must consider the following:

- The airplane vibration levels appropriate for a general aviation airplane; and
- The inertial loads that result from typical flight or ground maneuvers, including gusts and hard landings.

Any tendency for the firing mechanism to activate as a result of these loads or acceleration levels is unacceptable.

Other influences on inadvertent deployment include high intensity electromagnetic fields (HIRF) and lightning. Since the sensors that trigger deployment are electronic, they must be protected from the effects of these threats. To comply with HIRF and lightning requirements, the AmSafe, Inc., inflatable restraint system is considered a critical system, since its inadvertent deployment could have a hazardous effect on the airplane.

Given the level of safety of the occupant restraints currently installed, the inflatable restraint system must show that it will offer an equivalent level of protection for an emergency landing. If an inadvertent deployment occurs, the restraint must still be at least as strong as a Technical Standard Order approved belt and shoulder harnesses. There is no requirement for the inflatable portion of the restraint to offer protection during multiple impacts, where more than one impact would require protection.

The inflatable restraint system must deploy and provide protection for each occupant under an emergency landing condition. The side-facing seats of EMB-505 model airplanes are

certificated to the structural requirements of § 23.562 and Exemption 10321; therefore, the test emergency landing pulses identified must be used to satisfy this requirement.

A wide range of occupants may use the inflatable restraint; therefore, the protection offered by this restraint should be effective for occupants that range from the fifth percentile female to the ninety-fifth percentile male. Energy absorption must be performed in a consistent manner for this occupant range.

In support of this operational capability, there must be a means to verify the integrity of this system before each flight. Embraer S.A. may establish inspection intervals where they have demonstrated the system to be reliable between these intervals.

An inflatable restraint may be “armed” even though no occupant is using the seat. While there will be means to verify the integrity of the system before flight, it is also prudent to require unoccupied seats with active restraints not constitute a hazard to any occupant. This will protect any individual performing maintenance inside the cockpit while the aircraft is on the ground. The restraint must also provide suitable visual warnings that would alert rescue personnel to the presence of an inflatable restraint system.

In addition, the design must prevent the inflatable seatbelt from being incorrectly buckled and/or installed such that the airbag would not properly deploy. Embraer S.A., may show that such deployment is not hazardous to the occupant and will still provide the required protection.

The cabins of the Embraer S.A model airplane identified in these special conditions are confined areas, and the FAA is concerned that noxious gasses may accumulate if the airbag deploys. When deployment occurs, either by design or inadvertently, there must not be a release of hazardous quantities of gas or particulate matter into the cockpit.

An inflatable restraint should not increase the risk already associated with fire. Therefore, the inflatable restraint should be protected from the effects of fire to avoid creating an additional hazard by, for example, a rupture of the inflator.

Finally, the airbag is likely to have a large volume displacement, and possibly impede the egress of an occupant. Since the bag deflates to absorb energy, it is likely that the inflatable restraint would be deflated at the time an occupant would attempt egress. However, it is appropriate to specify a time interval after which the inflatable restraint may not impede rapid egress. Ten seconds has been chosen as reasonable time. This time limit will offer a level of protection throughout the impact event.

Type Certification Basis

Under the provisions of § 21.101, Embraer S.A. must show that the EMB-505 model airplane continues to meet the applicable provisions of the applicable regulations in effect on the date of application for the type certificate. The regulations incorporated by reference in the type certificate are commonly referred to as the "original type certification basis." The following model is covered by this special condition:

Embraer S.A. model EMB-505

For the model listed above, the certification basis also includes all exemptions, if any; equivalent level of safety findings, if any; and special conditions not relevant to the special conditions adopted by this rulemaking action.

If the Administrator determines that the applicable airworthiness regulations (i.e., part 23 as amended) do not contain adequate or appropriate safety standards for the AmSafe, Inc.,

inflatable restraint as installed on this Embraer S.A. model because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions, as appropriate, as defined in § 11.19, are issued in accordance with § 11.38, and become part of the type certification basis in accordance with § 21.101.

Special conditions are initially applicable to the models for which they are issued. Should the applicant apply for a supplemental type certificate to modify any other model included on the same type certificate to incorporate the same novel or unusual design feature, the special conditions would also apply to that model under the provisions of § 21.101.

Novel or Unusual Design Features

The Embraer S.A. EMB-505 model airplane will incorporate the following novel or unusual design feature:

A three-point safety belt restraint system incorporating an inflatable airbag at the aft position in the two-place side-facing divan

The purpose of the airbag is to reduce the potential for injury in the event of an accident. In a severe impact, an airbag will deploy from the shoulder harness, in a manner similar to an automotive airbag. The airbag will deploy between the head of the occupant and airplane interior structure and forward adjacent occupant, which will provide some protection to the head of the occupant and significantly limit forward flailing of the upper torso and head. The restraint will rely on sensors to electronically activate the inflator for deployment.

The Code of Federal Regulations states performance criteria for seats and restraints in an objective manner. However, none of these criteria are adequate to address the specific issues raised concerning inflatable restraints. Therefore, the FAA has determined that, in addition to

the requirements of part 21 and part 23, special conditions are needed to address the installation of this inflatable restraint.

Accordingly, these special conditions are adopted for the Embraer S.A. EMB-505 model airplane equipped with three-point inflatable restraints. Other conditions may be developed, as needed, based on further FAA review and discussions with the manufacturer and civil aviation authorities.

Applicability

As discussed above, these special conditions are applicable to the Embraer S.A. EMB-505 model airplane equipped with the three-point inflatable restraint systems.

Conclusion

This action affects only certain novel or unusual design features on the previously identified Embraer S.A. airplane model. It is not a rule of general applicability, and it affects only the applicant who applied to the FAA for approval of these features on the airplane.

Under standard practice, the effective date of final special conditions would be 30 days after the date of publication in the FEDERAL REGISTER; however, the substance of these special conditions has been subjected to the notice and comment period in several prior instances and has been derived without substantive change from those previously issued. It is unlikely that prior public comment would result in a significant change from the substance contained herein. For this reason, and because a delay would significantly affect the delivery of the airplane(s), the FAA has determined that prior public notice and comment are unnecessary and impracticable, and good cause exists for adopting these special conditions upon issuance. The FAA is

requesting comments to allow interested persons to submit views that may not have been submitted in response to the prior opportunities for comment described above.

List of Subjects in 14 CFR Part 23

Aircraft, Aviation safety, Signs and symbols.

Citation

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113 and 44701; 14 CFR 21.16 and 21.101; and 14 CFR 11.38 and 11.19.

The Special Conditions

The FAA has determined that this project will be accomplished on the basis of not lowering the current level of safety of the Embraer S.A. EMB-505 model airplane occupant restraint systems. Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for this model. *Embraer S.A., Model EMB 505; Inflatable Side-Facing Seat Three-Point Restraint Safety Belt with an Integrated Airbag Device in the Side-Facing Divan Aft Position of the Embraer S.A. EMB-505 model airplanes.*

In addition to the provisions of 14 CFR §§ 23.562 and 23.785, the minimum acceptable standards for certification of multiple place side-facing divans equipped with an airbag system in the shoulder harnesses are as follows:

1. It must be shown that the inflatable restraint will deploy and provide protection under the dynamic test conditions specified in Title 14 CFR § 23.562. It is not necessary to account for

floor warpage, as required by § 23.562(b)(3) or vertical dynamic loads, as required by § 23.562(b)(1). The means of protection must take into consideration a range of stature from a 5th percentile female to a 95th percentile male. The inflatable restraint must provide a consistent approach to energy absorption throughout that range.

2. The inflatable restraint must provide adequate protection for each occupant. In addition, unoccupied seats that have an active restraint must not constitute a hazard to any occupant.

3. The design must prevent the inflatable restraint from being incorrectly buckled and/or incorrectly installed such that the airbag would not properly deploy. Alternatively, it must be shown that such deployment is not hazardous to the occupant and will provide the required protection.

4. It must be shown that the inflatable restraint system is not susceptible to inadvertent deployment as a result of wear and tear or the inertial loads resulting from in-flight or ground maneuvers (including gusts and hard landings) that are likely to be experienced in service.

5. It must be extremely improbable for an inadvertent deployment of the restraint system to occur, or an inadvertent deployment must not impede the pilot's ability to maintain control of the airplane or cause an unsafe condition (or hazard to the airplane). In addition, a deployed inflatable restraint must be at least as strong as a Technical Standard Order (C114) certificated belt and shoulder harness.

6. It must be shown that deployment of the inflatable restraint system is not hazardous to the occupant or result in injuries that could impede rapid egress. This assessment should include occupants whose restraint is loosely fastened.

7. It must be shown that an inadvertent deployment that could cause injury to a sitting person is improbable. In addition, the restraint must also provide suitable visual warnings that would alert rescue personnel to the presence of an inflatable restraint system.

8. It must be shown that the inflatable restraint will not impede rapid egress of the occupants 10 seconds after its deployment.

9. The system must be protected from lightning and HIRF. The threats specified in existing regulations regarding lightning and HIRF, are incorporated by reference for the purpose of measuring lightning and HIRF protection. Also, for purposes of complying with these requirements, the airbag system is considered a critical system at pilot/co-pilot positions only.

10. It must be shown that the inflatable restraints will not release hazardous quantities of gas or particulate matter into the cabin.

11. The inflatable restraint system installation must be protected from the effects of fire such that no hazard to occupants will result.

12. There must be a means to verify the integrity of the inflatable restraint activation system before each flight or it must be demonstrated to reliably operate between inspection intervals.

13. A life limit must be established for appropriate system components.

14. Qualification testing of the internal firing mechanism must be performed at vibration levels appropriate for a general aviation airplane.

Issued in Kansas City, Missouri on March 16, 2012.

James E. Jackson

Acting Manager, Small Airplane Directorate
Aircraft Certification Service

[FR Doc. 2012-6956 Filed 03/22/2012 at 8:45 am; Publication Date: 03/23/2012]